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ABSTRACT

This publication is one in a series of three energy-related units selected from the "Environment and the Quality of Life" environmental education series. It contains numerous student learning activities for various grade levels, based on a number of behavioral objectives. Each activity provides the purpose, suitable grade level, related subjects, and methods. Subjects covered by the activities include language arts, social studies, science, mathematics, art, English, industrial arts, music, and home economics. A final resource lists supplementary references including books, films, and kits. (MA)

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Environmental Education Energy - Society

Grades 4-12



Produced by the New Jersey State
Council for Environmental Education
in cooperation with the New Jersey
Education Association

SE 020 739

ENVIRONMENTAL EDUCATION

ENERGY-SOCIETY

(Grades 4 - 12)

THE NEW JERSEY STATE COUNCIL FOR ENVIRONMENTAL EDUCATION
at Montclair State College
Upper Montclair, New Jersey
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In Cooperation With

THE NEW JERSEY EDUCATION ASSOCIATION

Pursuant to

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ENERGY - SOCIETY

INTRODUCTION

The activities in this book have been selected from a Computer Based Resource Unit entitled, "Energy - Society". It is one of thirteen units in the "Environment and the Quality of Life" series produced by the New Jersey State Council for Environmental Education, a federally funded project under Title III, Sec. 306 Elementary and Secondary Education Act, directed by Dr. Edward J. Ambry at Montclair State College, Upper Montclair, New Jersey.

Mr. Stephen Schoen, former Curriculum Specialist on the Council staff, coordinated the production of "Energy - Society" under the direction of Edna Doll, Assistant Director in Charge of Curriculum.

All the activities are related to learner objectives and are grouped for pupils at various grade levels. Not all objectives have activities for all grade levels. Teachers may adapt, adopt, correlate, separate or use these activities in a variety of ways which they determine will meet the needs of their students. Activities may be used with large groups, small groups or for individual instruction.

Also available at this time are two similar books containing student activities, entitled, "Energy - Technology" (grades 7-12) and "Energy - Transportation" (grades K-8). For information, write to the New Jersey State Council for Environmental Education, Montclair State College, Upper Montclair, New Jersey 07043.

Teachers desiring more complete information on these subjects may request Computer Based Resource Units. CBRU's include activities, content items which serve as background information for teachers and/or students, measuring devices, and lists of books, pamphlets, articles and multimedia materials, all related to specific learner objectives. CBRU's are available to all New Jersey teachers through the combined efforts of the New Jersey State Council for Environmental Education and the State Department of Education. Refer to the CBRU Resource Manual located in each school and fill out the required CBRU Request Form.

Thirteen Environmental Education CBRU's have been developed by the Council with the aid of consultants and specialists in Environmental Education, and Curriculum Development Teams, composed of teachers from all grade levels, teaching in urban, suburban, and rural districts, representing all sections of New Jersey. It is the desire of the curriculum developers that these units provide for exciting and relevant learning experiences for students. They embody educational materials which allow teachers a wide selection of alternatives for classroom use and for individualized approaches to the needs of pupils in elementary and secondary instructional programs.

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Art work by Deborah Healy, free-lance artist.

ENERGY - SOCIETY

INDEX

	<u>Page</u>
OBJECTIVES	
To identify United States trends in energy consumption since 1860.	1
To examine the relationship between growth in energy consumption and the Gross National Product.	3
To examine the relationship between energy consumption and population growth.	4
To evaluate current perceptions as to why there is an energy shortage.	5
To identify several important dimensions of the current energy shortage.	6
To identify the relationship between energy consumption, actual needs, and the stimulus for demand created through promotion and advertising.	8
To compare the environmental impact of selected alternative power sources.	10
To distinguish between short-term and long-term solutions to energy problems.	13
To attach social costs as well as economic ones to the price of energy for power.	15
To identify some effects resulting from increased energy prices.	17
To examine new forms of architectural design for buildings based upon efficient energy use and greater varieties of energy sources.	19
To identify the relationship between effective land use and regional planning to the use of energy.	21

	<u>Page</u>
To analyze the relationship between energy consumption and the automobile.	23
To discuss the impact of energy on United States agriculture and food production.	25
To assess the growing need for a coordinated National energy policy.	26
To demonstrate the value of public participation and referendum in the planning, development and conduct of power generating facilities.	28
To identify consumer products from petrochemicals.	29
To examine the regulatory mechanisms for monitoring and controlling nuclear power development.	30
To determine public health hazards associated with nuclear power development.	32
To evaluate the notion that abundant, clean and efficient energy will solve many of mankind's social ills.	34
To determine ways in which citizens can personally respond in times of energy shortage.	36
To determine recycling and reuse of materials as it relates to energy conservation.	39
To discuss social and economic incentives in attaining sound energy conservation measures.	43
INTERESTING SUPPLEMENTARY REFERENCES	45

- OBJECTIVE: To identify United States trends in energy consumption since 1860.
- PROBLEM AREA: Energy - Society
- GRADE LEVEL: 4-6
- SUBJECT: Art, Science, Social Studies
- ACTIVITY: 1. Create a mural showing the historical progression of fuel uses, from wood to what is proposed for the future - possibly nuclear fuel, or solar energy.
- SUBJECT: Art, Social Studies, Language Arts
- ACTIVITY: 1. Trace the development of one particular historical application of energy. Example: in cooking, heating or transportation. This might be shown in written, illustrated or recorded form, or on a mural for the rest of the class and the school to enjoy.
- GRADE LEVEL: 7-9
- SUBJECT: Language Arts, Social Studies, Science
- ACTIVITY: 1. As a class or individual project, make a notebook describing the uses of different kinds of energy (i.e., fossil fuels, nuclear power, solar energy). Include photographs, advertisements, articles, diagrams, illustrations, written explanations and summaries. If possible, include a bibliography for further reference. Present the book to your school library as a resource.
- GRADE LEVEL: 7-9
10-12
- SUBJECT: Social Studies
- ACTIVITY: 1. Discuss the fact that since the 1920's, the United States population has doubled, but the number of automobiles has increased by nearly 800 percent and that the average person per auto is 1.2 percent. Construct a line graph illustrating the population growth and the growth in automobiles in the U. S. in the last 50 years.
- SUBJECT: English, Social Studies, Science
- ACTIVITY: 1. In a class discussion, come to some conclusion about the predominant energy source for each of the following years: 1890, 1920, 1935, 1955, and 1970. Select one to research and write a report including diagrams and illustrations.

SUBJECT: Mathmetics, Science

ACTIVITY: 1. Using figures provided, or your own, correctly plot growth of energy consumption in the United States between 1880 and 1975. Superimpose a second plot of population growth during this period. Accurately relate the two. Explain your graphs to the class.

GRADE LEVEL: 10-12

SUBJECT: Science, Mathematics

ACTIVITY: 1. Extrapolating from data provided to you, or that which you have researched, predict what energy sources will be utilized in the United States in the year 2000, and the total kilowatt hours expended by the entire population. Compare your projections with projections made by "experts". Differences in figures constitute a basis for measuring your success. (Although predictions are never entirely accurate, they are valuable and necessary indices for a society.)

SUBJECT: English, Social Studies, Art

ACTIVITY: 1. The United States was at one time described as having streets paved with gold. This was during hard times in Europe and people looked to America as a kind of Utopia. Do some research on Utopias which have existed at various times in history. What are the similarities between Utopias and the lifestyles of the wealthy. How are present day Utopias more reliant on energy than those of the past? Why do people still dream of Utopias? Will changing energy costs change the kinds of Utopias of which people dream? You might want to sketch, draw or paint different conceptions of Utopias.



OBJECTIVE: To examine the relationship between growth in energy consumption and the Gross National Product.

PROBLEM AREA: Energy - Society

GRADE LEVEL: 7-9
10-12

SUBJECT: Mathematics, Science, Social Studies

- ACTIVITY:
1. Plot GNP and energy consumption for the period 1950-1975. Accurately interpret these figures to the class.
 2. The consumption of electrical energy is proportional to the growth of population. The more people there are, the more electrical energy they will consume. Make a graph of the following data:

<u>Country</u>	<u>GNP (Dollars/Capita)</u>	<u>Energy Consumption 10⁶ BTU/Yr/Capita</u>
Japan	575	30
Ireland	700	40
France	1400	55
West Germany	1400	85
Australia	1550	90
Canada	1950	130
United States	2800	180

From this graph, do you feel that energy consumption is proportional to GNP? You might find some other countries' GNP's and plot them on the graph. What effects will this relationship between GNP and energy consumption have on future needs for energy if the under-developed countries become more and more developed? Can you accurately predict what the energy needs will be in the future for various countries? Where would countries such as Japan and Ireland get the needed energy? What effect would an oil embargo have on these countries?

SUBJECT: Language Arts, Social Studies

- ACTIVITY:
1. In a current magazine or newspaper, read an article or articles on GNP. Summarize your findings to the class. You might try Time, Newsweek, Fortune, the financial pages of the New York Times, etc.

SUBJECT: English, Social Studies

- ACTIVITY:
1. Do some research on GNP. Write a definition of what it is. Relate it to energy consumption, industrialization, standards of living, quality of life and/or other areas which might be of interest to you.

OBJECTIVE: To examine the relationship between energy consumption and population growth.

PROBLEM AREA: Energy - Society

GRADE LEVEL: 4-6
7-9
10-12

SUBJECT: Social Studies, Language Arts

ACTIVITY: 1. Obtain from utilities companies the average family consumption of their product between 1920-1975. Report your findings to the class. You might want to do it in a pictorial way. The reasons for the growth would lend themselves to this kind of report.

GRADE LEVEL: 7-9
10-12

SUBJECT: Mathematics, Science, Social Studies

ACTIVITY: 1. Construct a graph which shows population growth of any foreign country and its energy consumption over the past several decades. Compare this graph with one for the United States. Explain the differences.

2. Write a newspaper article indicating data on energy consumption and population growth. Use any predesignated time period in the United States.

3. Construct a graph which shows population growth on one axis and energy consumption on the other for the United States for any period given you by your teacher. Note relationships between the two, and project for the future.

GRADE LEVEL: 10-12

SUBJECT: Social Studies, Language Arts

ACTIVITY: 1. Discuss three ways in which energy consumption can be leveled off. Then, discuss three ways which might be used to stabilize population growth. How controversial are the methods you suggest? Would people accept them?

Note: Teachers who are interested in this topic will find more information and activities in the Computer Based Resource Unit on Population (#133).

OBJECTIVE: To evaluate current perceptions as to why there is an energy shortage.

PROBLEM AREA: Energy - Society

GRADE LEVEL: 7-9
10-12

SUBJECT: Language Arts, Social Studies

ACTIVITY: 1. Conduct research on the energy shortage. Is it a thing of the past or will it be ever with us? Make a collection of what Congressmen, administrative officials and other leaders have said about the energy problem. Find at least one with whom you can agree and tell why.

SUBJECT: Language Arts, Social Studies, Science

ACTIVITY: 1. Sample any three people and ask each his or her opinion on why there is an energy shortage. Of the ten, select four responses you feel were most correct. Record or transcribe the responses so that your final selection can be discussed and evaluated by the class or the teacher.

GRADE LEVEL: 10-12

SUBJECT: Language Arts, Social Studies

ACTIVITY: 1. In an article entitled "Energy - Crisis and Challenge" ('Spectrum', May, 1973), G. Friedlander analyzes the current energy shortage to determine how it occurred. He concludes that government, the regulatory agencies, oil suppliers, and the general public as well are to blame. Discuss or debate this conclusion by suggesting why the blame can be fixed in these sectors. You may add your own arguments to the debate. Support your statements and conclusions.

2. Research foreign publications to determine how the energy crisis is perceived by other people of the world.

SUBJECT: Social Studies, Science, English

ACTIVITY: 1. Write to Exxon for copies of a booklet entitled, "What should be done about the energy problem". Review carefully the reasons given on page two for the reasons behind the energy shortage. How do these reasons relate to societal concerns for the environment? Are the two mutually exclusive? Ask a representative of an environmental group or an environmental expert to discuss with your class the points made by Exxon in their explanation of the shortage. (Write to Exxon, Public Affairs Department, P. O. Box 2180, Houston, Texas 77001 for the booklet.)

- OBJECTIVE:** To identify several important dimensions of the current energy shortage.
- PROBLEM AREA:** Energy - Society
- GRADE LEVEL:** 4-6
7-9
- SUBJECT:** Art
- ACTIVITY:** 1. Design and execute a poster or cartoon which will focus people's attention on some dimension of the energy shortage. Examples - conservation, federal control, development of alternate energy means, etc.
- GRADE LEVEL:** 4-6
7-9
10-12
- SUBJECT:** Social Studies
- ACTIVITY:** 1. Name some energy related materials which the United States must import. What happens when other countries do not want to sell to us? (Explain in terms of what happens here, as well as what happens in the selling country.) What is a "money drain"? On a map of the world locate countries which sell needed materials to us.
- SUBJECT:** Social Studies, Science
- ACTIVITY:** 1. A key dimension of energy consumption is that our fossil fuels are limited. Obtain from the American Petroleum Institute and/or other sources projections which show future development and end periods of various fuels. (Wildlife Magazine has a special yearly issue on the Environment with information on this topic. You might check with your librarian.) Present your material to the class in an interesting way. Discuss what can be done to conserve fuels. Is it necessary to conserve them in the light of developing other energy forms? (Solar, nuclear, etc.)
- GRADE LEVEL:** 7-9
10-12
- SUBJECT:** Social Studies
- ACTIVITY:** 1. Do some research on atomic energy. How many atomic energy plants are there in New Jersey? In the United States? How many are proposed? How much energy will we derive from these plants? Would this development save us from energy shortages? How? What problems do we face in using nuclear energy?

2. Give at least three reasons for United States dependence on oil imports. What problems does this cause in terms of meeting the balance of trade, development of other countries, etc.?

GRADE LEVEL: 10-12

SUBJECT: Social Studies, Language Arts

ACTIVITY: 1. Place the key dimensions of the energy shortage in one or more of the following categories:

- A. Short-term solutions
- B. Medium-term solutions
- C. Long-term solutions

Correctly explain why each falls in a given category.

SUBJECT: Science, Social Studies, English

ACTIVITY: 1. Write a paper on a single dimension of the United States energy shortage and include proposed recommendations for a solution. For example, increase in per capita gasoline consumption. Solutions might be:

- A. Removal of air pollution devices from engines
- B. Engine redesign
- C. Improved mass transit.

- OBJECTIVE:** To examine the relationship between energy consumption, actual needs, and the stimulus for demand created through promotion and advertising.
- PROBLEM AREA:** Energy - Society
- GRADE LEVEL:** 4-6
7-9
10-12
- SUBJECT:** Language Arts
- ACTIVITY:** 1. Over one week make a list of all words used in the marketing of energy consuming devices observed on television or radio. These would include appliances, and even automobiles. At the end of the week, combine and compare your lists with others. What are the "come-on" words? Are they general in nature or specific? Do they appeal to a certain segment of the population (young people, old people, men, women, Blacks, etc.)?
- SUBJECT:** Social Studies, Art, Language Arts
- ACTIVITY:** 1. Discuss various forms of packaging. Why are products packaged as they are? Bring in, or describe some examples of packaging which are particularly blatant in catching the buyer's eye and creating an appeal for the contents. Compare kinds of cereal packaging, or kinds of detergent packaging, etc. Discuss the waste of energy and materials. Take an example of a product considered over-packaged and redesign the package. The final product should be a package that is sympathetic to the contents. Examples might include a toy stove box that is a container for toy cookware, a flower pot that is also a container for seeds, a wardrobe that is the package for a doll's dress.
- GRADE LEVEL:** 7-9
10-12
- SUBJECT:** Social Studies, Language Arts
- ACTIVITY:** 1. Secure from magazines or other media sources at least five examples of advertising for energy consuming products which appeal directly to the consumer. Analyze the advertising. Why does it make you want the product? What psychology is used?
- SUBJECT:** Language Arts, Art, Social Studies
- ACTIVITY:** 1. In order to sell their product, advertisers appeal in subtle ways to our need for acceptance by others and to our fears about our own inadequacy. Usually present is

the idea of a magical transformation from an individual who is drab, unlovely, with a bad odor, or without "zing" into someone beautiful, with a brighter smile, sex appeal, and in general, admirably socially acceptable. Beliefs in magical transformation and happy endings might contribute to a rather unrealistic approach to life. Class will try writing copy for a luxury product that is energy consuming and expensive (and which has a cheap, and easy substitute). Be realistic in approach, and as honest as possible in making the buyer want the product. Illustrate with drawings, a painting or a photograph.

SUBJECT: Manual Arts, Art, Language Arts

ACTIVITY:

1. Class will work as a "company" to manufacture items for sale, either actually or in an imaginary way. Each kind of energy used should be noted and listed, and each cost, both real and hidden should be noted. An item for manufacture might be leather wrist bands with the buyer's name engraved, or sand candles. In any event, try to make something out of scrap or left over materials (i.e., the leather jewelry) or a product which will save energy (i.e., "eat by candle-light"). Work up an advertising campaign to sell your product. Can you create a demand with your "ads"? How much does it help to have an "environmentally sound" product to sell?

SUBJECT: Social Studies

ACTIVITY:

1. Select some items in your home which your family has purchased in the last year and divide them into the following categories:
 - A. Actually needed
 - B. Demand stimulated by advertising
 - C. Not sure

Compare results with other class members. Perhaps your family needed an article and bought a certain brand because of advertising? Did the product live up to expectations? Is it used as frequently as you thought it would be? (Dream a minute. Is it actually needed in terms of energy used? What if everyone in the U.S.A. had one?)
2. Conduct research on automobile advertising and design. Is it true that automobile companies simply respond to consumer demand in producing the kinds of cars they do, or does advertising condition our wishes? Collect pictures of ads and cars as well as doing some reading. Make a booklet of your research and keep it handy for a reference in the class.

- OBJECTIVE: To compare the environmental impact of selected alternative power sources.
- PROBLEM AREA: Energy - Society
- GRADE LEVEL: 4-6
- SUBJECT: Science, Social Studies
- ACTIVITY:
1. Compare how long it would take your father to walk or bicycle to work, and how long it takes him to get there by car. In which ways is the environment affected by each method? Is time worth money to your father? What does this saying mean? How does it explain our reliance on automobiles?
- GRADE LEVEL: 4-6
7-9
- SUBJECT: Science, Art, Industrial Arts
- ACTIVITY:
1. Develop a flow chart on the bulletin board showing the route followed by petroleum from its subterranean reservoir to the combustion chamber of an engine. Explain the impact on the environment at various points of the route.
- SUBJECT: Art
- ACTIVITY:
1. Create a mural on brown paper showing the evolution of fossil fuels from early plant life to use by man. If desired, instead of this, the class could work on stages in the history of energy use by man (e.g., slaves, animals as transportation, on treadmills, windmills, waterwheels, wood, steam). In each case, show what happens to the environment.
- GRADE LEVEL: 7-9
10-12
- SUBJECT: Social Studies, Science
- ACTIVITY:
1. Of the four grades of coal - anthracite, bituminous, subbituminous and lignite - it has been stated that anthracite is the most valuable form. Using a geology or earth science textbook, make a list of the properties of these types of coal, including such features as heat of combustion, sulphur content, ash content, moisture, availability, etc. From this list, determine which is the second most valuable form. How does sulphur or ash

content influence the uses of coal? What steps must be taken if we are going to use all of the coal available and yet preserve our environment?

SUBJECT:

Art

ACTIVITY:

1. Choose one type of energy (electrical, nuclear, hydraulic, kinetic, fossil). Using the type of energy chosen as a theme, design either wallpaper, textile, border design, or wrapping paper in a repeat pattern. Keep in mind the types of line, form, and colors that would be sympathetic to an energy theme. Be able to explain why you chose the theme you did and its impact on the environment.

GRADE LEVEL:

10-12

SUBJECT:

English, Social Studies, Science

ACTIVITY:

1. Using the hypothesis that a new form of energy had been discovered (i.e., the black holes in space) that would solve, if utilized correctly, all of the world's energy problems, write and illustrate a magazine article or magazine ad for it. Included should be such considerations as supply of fuel, safety, polluting tendency, mode of delivery, etc.
2. Write to the Sierra Club to see which power projects it is opposing and why. Then, write to the developers of these projects to see how they perceive their impact on the environment.

SUBJECT:

Science

ACTIVITY:

1. At what point from energy resource extraction to its ultimate use by the consumer, is potential environmental damage the greatest? Answer separately for any three of the following and be able to substantiate your answer: oil, coal, nuclear, hydroelectric, solar.

SUBJECT:

English, Social Studies, Science, Art

ACTIVITY:

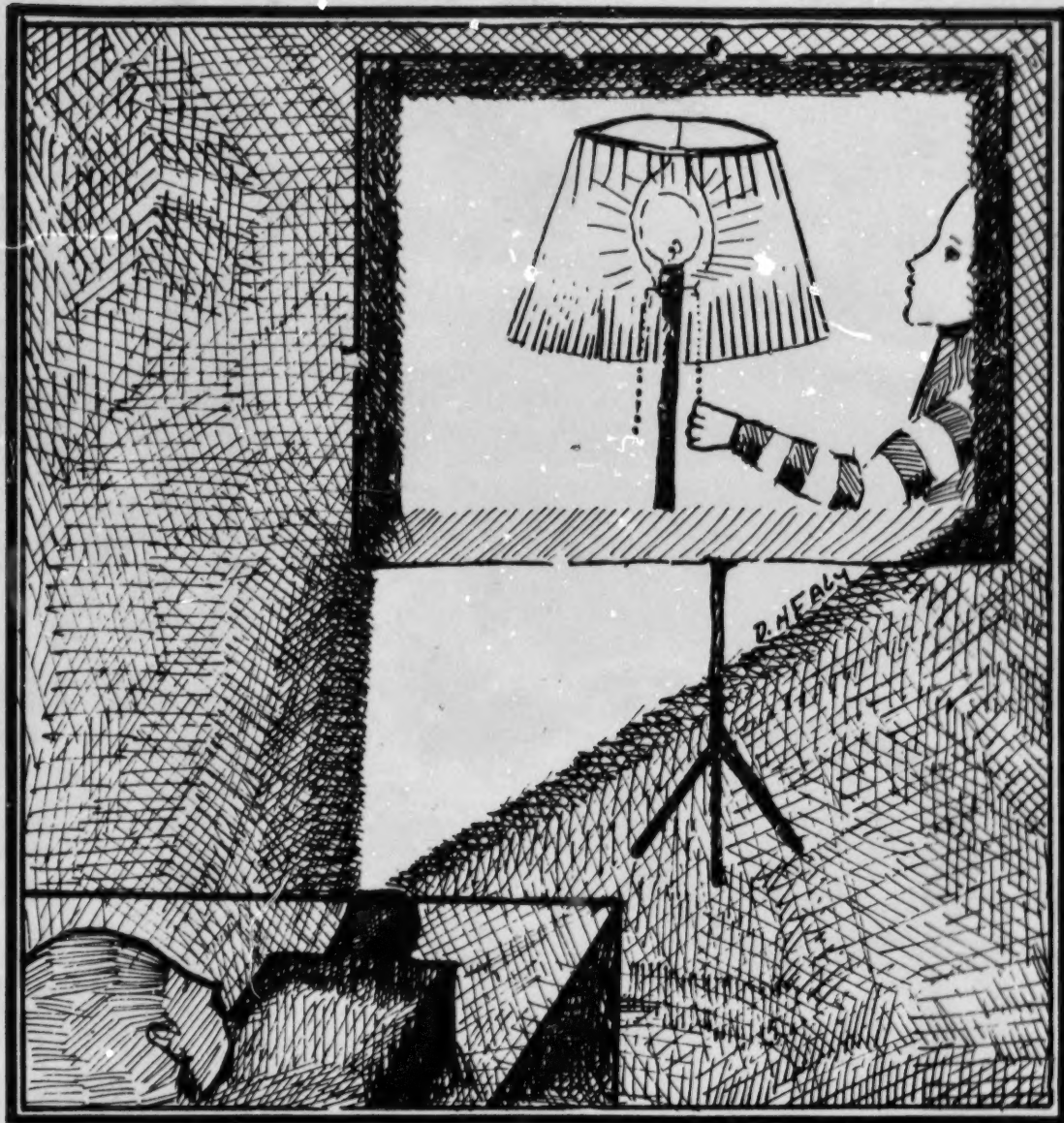
1. In the September 1971 "Scientific American" there is a very good article about the uses of solar energy. This article is entitled 'The Energy Resources of the Earth'. In the article is a chart which shows the flow of energy from various sources of energy, such as solar, fossil fuel, geothermal and tidal energy. Study the chart and answer the following questions. How do the amounts of available energy compare? Which has the most amount of available energy? Make a chart listing each fuel and the effect of its use on the environment. The chart could be a pictorial representation.

SUBJECT:

Science, Social Studies, English, Art, Industrial Arts

ACTIVITY:

1. Prepare a slide show depicting types of energy used today and how these types may be obsolete 20 years from now. What kinds will be used then? Present your show to the P.T.A. or any of the social or fraternal organizations of your community.



- OBJECTIVE: To distinguish between short-term and long-term solutions to energy problems.
- PROBLEM AREA: Energy - Society
- GRADE LEVEL: 4-6
7-9
- SUBJECT: English, Science
- ACTIVITY: 1. There are at least two ways of cutting down on home heating fuels. One is immediate. Voluntarily set the thermostat lower. The second choice may take longer since it involves money - insulating the house so that heat loss is reduced. Choose one way and substantiate your choice.
- GRADE LEVEL: 7-9
- SUBJECT: Science
- ACTIVITY: 1. Determine how much gas would be saved by a family if, for a given year - 1) Sunday driving was banned, 2) all cars were reduced to four cylinders.
- GRADE LEVEL: 7-9
10-12
- SUBJECT: Science
- ACTIVITY: 1. Make a list of ten problems having to do with energy. Categorize them into one of the two following areas: 1) short-term resolution, 2) long-term resolution.
- SUBJECT: Science, Social Studies
- ACTIVITY: 1. Presently, oil and natural gas account for 80 percent of American energy consumption - estimates indicate that almost 90 percent of all United States fossil fuel reserves are in the form of coal. Develop a series of scenarios based on the following - fuel oil for heating and electrical generation has risen in price to \$.70 per gallon. 1978 gasoline prices are \$1.00 per gallon. Gasoline rationing allows 15 gallons per family per week. What is the general effect of all this on the style of American life and American social structure? How would a student reconsider and reorder his personal plans and priorities in order to deal with such a future?
- SUBJECT: Art, Industrial Arts, Science
- ACTIVITY: 1. Construct a model of a given area of the community. Include in the model the existing residential, industrial and recreational areas. Mark all roadways, airports and

railroads. All parts of the model should be movable. The model can be used to demonstrate existing problems of traffic jams or areas of heavy pollution. Also, the model can be used to work out improvements and changes. What can be done immediately? What changes will have to be made in the future? Why?

GRADE LEVEL: 10-12

SUBJECT: Science, Social Studies

ACTIVITY: 1. Discuss the following long and short term ways of saving energy: 1) immediate car pooling, 2) diversion of highway funds to the improvement of mass transit systems. In your opinion, which of these promises a longer-run saving of energy? Explain why.

SUBJECT: Social Studies, Science, English

ACTIVITY: 1. You have been appointed Chief Energy Advisor to the President and charged with the responsibility for making short and long term recommendations, regarding alternative modes of transportation in light of the energy shortage. In developing your proposals consider:

- a) What alternatives will you present (e.g., mass transit vs. individual cars, gasoline vs. atomic energy)?
- b) What effects will each alternative have on the environment? Explain how pollution will be affected (air, water, noise, visual pollution levels).
- c) What effects will each alternative have on natural resources, such as oil, coal, uranium, etc.?
- d) What effects will the alternatives have on society (i.e., lower class vs. upper class, leisure activities, economic mobility)?
- e) What effects will each alternative have on the economy (large scale manufacturing vs. single proprietorship, advertising, packaging companies, trucking companies, etc.)?
- f) Which alternatives do you endorse and why?

This activity may be done by groups within the class. Each group might develop one of the considerations mentioned above.

- OBJECTIVE:** To attach social costs as well as economic ones to the price of energy for power.
- PROBLEM AREA:** Energy - Society
- GRADE LEVEL:** 4-6
7-9
10-12
- SUBJECT:** English, Music, Creative Writing
- ACTIVITY:** 1. Write a story, poem, ballad or folk song on "The Month There Was No Gasoline - No Gasoline At All." Include the social, political and economic ramifications of this event and what it might portray for the future. Perform for classmates and any other audience you select.
- GRADE LEVEL:** 7-9
- SUBJECT:** Social Studies, Music
- ACTIVITY:** 1. Select one form of energy. Write a TV commercial for it. Include social implications which will make this form of energy acceptable. Present your commercial to the class as a springboard for discussion.
- GRADE LEVEL:** 7-9
10-12
- SUBJECT:** Art, Social Studies
- ACTIVITY:** 1. Give three practical examples of how social costs can be applied to the automobile to encourage consumers to buy cars that are most energy-efficient. Illustrate them, perhaps in cartoon style.
- SUBJECT:** Science
- ACTIVITY:** 1. Using nuclear power as a case in point, list five items which are direct economic costs to the consumer and three items which are social costs.
- GRADE LEVEL:** 10-12
- SUBJECT:** English, Science, Social Studies
- ACTIVITY:** 1. In a paragraph or two, distinguish the difference between a social/environmental cost and an economic cost.

SUBJECT: English, Music, Creative Writing

ACTIVITY: 1. During its coal shortage, Britain went on a three-day work week. Write a poem, ballad or story depicting what you think the social costs might have been in terms of family harmony, stability and solidarity. You might choose a positive or negative side to portray.

SUBJECT: English, Social Studies

ACTIVITY: 1. Write a paper on the history of the Alaska pipeline - how and why it came into being. How has life in many places in Alaska changed because of the pipeline? Are the changes good or bad or a bit of both?



OBJECTIVE: To identify some effects resulting from increased energy prices.

PROBLEM AREA: Energy - Society

GRADE LEVEL: 4-6

SUBJECT: English, Social Studies, Science

ACTIVITY: 1. Discuss how your parents would react if the price of gas were suddenly increased to \$1 a gallon. How would your parents behave differently? How would this change affect you? What are the chances for this happening? What could be done to make the situation more bearable?

GRADE LEVEL: 4-6
7-9

SUBJECT: Science, Social Studies, English

ACTIVITY: 1. Write a letter to a friend explaining what leisure time travels that you now enjoy might have to be curtailed or abandoned if energy prices are greatly increased. Consider car trips, trailers, campers, boats, as well as increased fares on buses, trains and planes. What enjoyable substitutes can you plan?

GRADE LEVEL: 7-9
10-12

SUBJECT: Social Studies, Science

ACTIVITY: 1. Large office buildings, factories and shopping centers use a great deal of energy in the form of light. Visit one of these places and observe the lighting system. Make some recommendations for saving energy. Be sure your recommendations are consistent with health and sight regulations as well as safety measures.

2. Owing to the fuel shortage, which of the following would society be able to close down with the least harm to our existing social structure - clothing stores, movies, schools, churches and synagogues, museums and zoos, music halls, sports arenas. Arrange them in the order you believe to be most practical and explain why.

SUBJECT: Social Studies, Careers, English

ACTIVITY: 1. Make a list of occupations which are highly dependent on transportation. Consider doctors, pilots, salesmen, delivery people, etc. How will increases in the cost of fuels affect their livelihoods? Select one occupation

from the list and prepare a report. You might wish to interview a person in that category for added information. Base your report on the need of and expenses for mobility.

SUBJECT: Social Studies, Economics, Science

ACTIVITY: 1. List three negative and three positive effects of a price increase on energy related products and services.

SUBJECT: Social Studies, Science

ACTIVITY: 1. Make a class list of many of the things you do which require energy. Assume the cost of energy will go up astronomically, making many of these activities prohibitive. As an individual, select 10 or 12 activities from the list and make up alternatives which you could live with - e.g., now you drive to school - alternates could be to walk, ride a bus, form a car pool. Try out a few of your alternates.

SUBJECT: English, Social Studies

ACTIVITY: 1. Write an imaginative story of a family living 20 years in the future. Energy is now terribly expensive. How has the family life style been altered? Explain the good and not so good factors which have resulted.

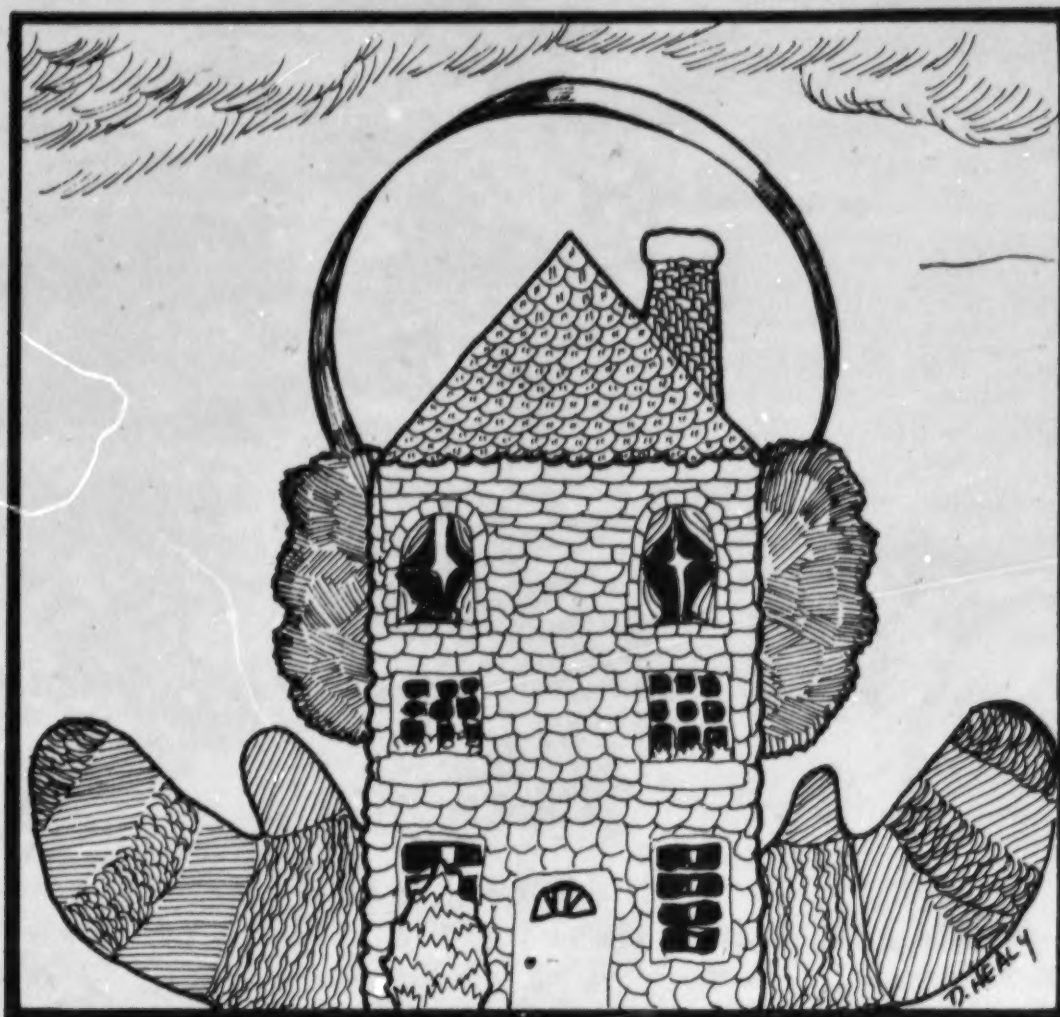
- OBJECTIVE:** To examine new forms of architectural design for buildings based upon efficient energy use and greater varieties of energy sources.
- PROBLEM AREA:** Energy - Society
- GRADE LEVEL:** 4-6
7-9
- SUBJECT:** Industrial Arts, Science, Social Studies
- ACTIVITY:** 1. Collect some examples from magazines where building design is compatible with energy efficiency and where geography and climate have been considered in the design. Explain one of the designs to your classmates.
- GRADE LEVEL:** 4-6
7-9
10-12
- SUBJECT:** Science, Industrial Arts
- ACTIVITY:** 1. Make a collection of newspaper and magazine articles on new and proposed methods of heating. Place them in a folder for classroom reference.
- GRADE LEVEL:** 7-9
10-12
- SUBJECT:** Industrial Arts, Social Studies, Art, Home Economics, Mathematics
- ACTIVITY:** 1. Plan a home for yourself and your family. Use graph paper and arrange a scale (i.e. one square = one foot). Show what new forms of energy you would use for heat and light.
- SUBJECT:** Industrial Arts, Social Studies, English
- ACTIVITY:** 1. Interview an architect and ask him how the construction of buildings could change to allow for more efficient use of and a greater variety of energy sources. Prepare your questions in advance. If possible, tape the conversation to share with classmates.
- GRADE LEVEL:** 10-12
- ACTIVITY:** 1. Write an essay on the relationship between building design and geographical and climatic setting (location). Show when these factors are brought together, a more energy efficient design can be created.

SUBJECT: Industrial Arts, Art, Home Economics

ACTIVITY: 1. Make a model of a house for a family of four living in the year 2000. Develop a new type of energy for the power needed to make the house enjoyable. If a class scale was worked out, the houses developed by individuals within the class could be used in the development of a community.

SUBJECT: Industrial Arts, Art, Science

ACTIVITY: 1. Working with a floor plan for a typical house or apartment in your community, modify the dwelling in any way you wish to achieve the dual goals of maximum energy conservation and maximum comfort and safety. Try to determine the costs.



OBJECTIVE: To identify the relationship between effective land use and regional planning to the use of energy.

PROBLEM AREA: Energy - Society

GRADE LEVEL: 7-9
10-12

SUBJECT: Social Studies

- ACTIVITY:
1. Identify and outline the land use zones on a map of your community. Identify the business and commercial, industrial and residential areas. Using the map legend, determine the correlation between zones and transport systems which serve them (e.g., industrial railway, major highway, residential-secondary roads). Given a second chance, how could your community rezone to conserve energy?
 2. Victor Gruen is a city planner who advocates that cars be kept out of the city. In business and shopping areas, he would turn the streets into pedestrian malls. Debate the pro's and con's of Mr. Gruen's plan. Include in your arguments the effect of such a move on business, the environment, energy use, etc.
 3. Discuss the following: Why doesn't the State of New Jersey permit offshore drilling? What does the State Environmental Protection Agency and the leaders of the legislature say about this? What has been California's experience with offshore drilling? Before discussion, make a brief outline of the points you wish to make. Does off-shore drilling affect land use? How? Do the decisions made in New Jersey affect other states? What can be done about interstate planning?
 4. Do some research on a planned community (e.g., Reston, Virginia; Radburn, New Jersey). Compare the energy used in a planned community to one which "grew like Topsy". If you possibly can, visit a planned community.

SUBJECT: Social Studies, Art

- ACTIVITY:
1. Select an unused area of your town or city. It may be a large piece or an empty lot. Role play the parts of citizens to decide how it should be used. Roles which might be chosen: fireman, town planner, politician, real estate man, housewife, State Ranger, factory worker, school child, store owner, etc. Sketch how you would like to see the land used as well as the types of energy that would go into the implementing of that use. Possibly the class might vote on which is the "best" use of the land.

GRADE LEVEL: 10-12

SUBJECT: Social Studies

ACTIVITY:

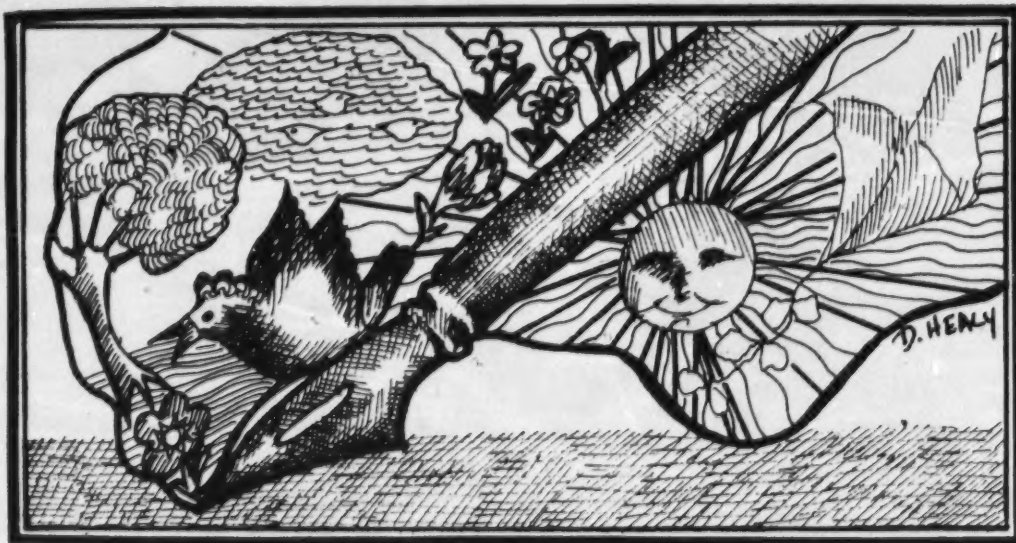
1. Intrinsic to the concept of land use is the concept of territoriality. Discuss what you feel is your own territory. Demonstration might be seen if one student takes another's pocketbook, sits in one's chair, or move very close to another. (Illustrate the concept with examples from the animal kingdom.) Students should then discuss how energy is used to preserve the borders of territory. (Answer could include anything from survey of the 1/4 acre plot of suburbia, manufacture of walls and fences, use of burglar alarms, electronic devices, fabric for curtains, planting of shrubbery, etc.) If desired, this could become a long term project with class researching and depicting graphically how other cultures cope with preservation of territoriality. How does this feeling of territoriality interfere with cooperative and regional planning?

SUBJECT: Social Studies, Art

ACTIVITY:

1. Describe a site in your town which you consider to be beautiful. Justify this choice by reasons, or sketches, or photographs. Then, describe a site in your town which you consider less satisfying. Redesign the second site, making it as attractive as possible, using a minimum of energy to do the work. Redesign a second time. What changes would you make if energy were cost free?

TO THE TEACHER: Much more information on Land Use may be found in the Computer Based Resource Unit entitled "Land Use", #142, for grades 4-12.



OBJECTIVE: To analyze the relationship between energy consumption and the automobile.

PROBLEM AREA: Energy - Society

GRADE LEVEL: 4-6
7-9

SUBJECT: Social Studies, Science, Art

ACTIVITY: 1. Explain as many forms of energy as you can which are used in the manufacture of an automobile. Illustrate one of them.

GRADE LEVEL: 4-6
7-9
10-12

SUBJECT: Social Studies, Science

ACTIVITY: 1. Keep track for one week of all the places you go that require a car. Divide the list into four categories -
a. Places you have to drive to
b. Places you could get to without driving, but with difficulty
c. Places you could get to fairly easily without driving
d. Places you could get to using other transportation
Report and discuss collective findings in class.

GRADE LEVEL: 7-9

SUBJECT: Mathematics, Social Studies

ACTIVITY: 1. Research and discuss the amount of fuel saved when speed limits are lowered as they have been during the energy crisis. Do lower speeds have any effect on traffic safety? What are other desirable and undesirable effects of a 55 mph speed limit.
2. Discuss Federal transportation priorities. In 1968, they were as follows:

Highways	70 percent	Budget Allocation
Air Travel	15 percent	" "
Waterways	14 percent	" "
Mass Transit	1 percent	" "
Railroads	0.2 percent	" "

Make a pie graph of the above information and use it in the discussion. Perhaps you can do some research and get more recent figures.

3. Select a total of ten makes of automobiles at random and then rank order them in terms of gasoline consumption (miles per gallon). If a driver drives an average of 1000 miles per month, compute his cost in gasoline alone (using current gas prices) for each of the ten different cars. Make a graph of the results.

GRADE LEVEL:

7-9
10-12

SUBJECT:

Social Studies, Science

ACTIVITY:

1. Review and discuss auto advertisements over the past 20 years. Look at old magazines in the library. In what ways has the message changed? In what ways have automobiles actually changed in terms of size, price, gasoline consumption, safety, styling, kind of engine, etc.? Look at family photographs where cars are shown. How does the car your family owns today differ from the one your parents had when they were your age? Was more or less energy used by them?

SUBJECT:

Social Studies, Science, English

ACTIVITY:

1. Imagine two possible situations - the first involves taking a trip from home to California by automobile - the second involves taking the same trip by bus. Think about how these two situations would differ if you were actually involved in such a trip. Which would be more expensive? Which would save the most energy? Which would be most desirable to you personally? Which would be the most adventuresome? Prove your points.

GRADE LEVEL:

10-12

SUBJECT:

Industrial Arts, Science, Mathematics

ACTIVITY:

1. Correctly name some components of automotive design and engineering which can affect gasoline consumption.

OBJECTIVE: To discuss the impact of energy on United States agriculture and food production.

PROBLEM AREA: Energy - Society

GRADE LEVEL: 4-6

SUBJECT: Science, Social Studies, Art

ACTIVITY:

1. Illustrate some examples of where fossil fuel energy has been infused into the agricultural production in the United States.
2. Take a field trip to a working farm, observe the types of energy used in the farming. Ask questions of the farmer as "In what way has farming changed over the last twenty years? In what ways has equipment changed over the past twenty years? Has the volume of production become larger or less? Has the profit become greater, or is it less profitable per man hour now? Is more human labor used or less? Do you ship foods to the same places now or are the areas that buy your goods changed?, etc. Make a mural of the farm or have each pupil choose one phase of farm life to illustrate and arrange the pictures as you would a mural.

GRADE LEVEL: 7-9
10-12

SUBJECT: Home Economics, Science, Social Studies

ACTIVITY:

1. Trace and list the forms of energy used to produce a can of food (tomatoes, beets, etc.). Included should be such considerations as sun needed, harvesting equipment and human energy expended, processing, packaging, labels, shipping, advertising, opening, etc.

GRADE LEVEL: 10-12

SUBJECT: Science, Social Studies

ACTIVITY:

1. Do some research to see how other countries use energy in agriculture. Compare their methods to those used in the United States. Where is energy used more efficiently? Do a report on this subject and present it to the class.
2. The comic strip "Little Abner" has a character or cast of characters called "shmoos". These animals are anxious to be of service to mankind insofar as they only wish to be eaten and would assume the appearance and flavor of whatever food the consumer wanted. They propagate on demand and are the solution to the world's food problems. Create a fantasy solution to the world's energy problems and do a comic strip to depict it.

- OBJECTIVE:** To assess the growing need for a coordinated National energy policy.
- PROBLEM AREA:** Energy - Society
- GRADE LEVEL:** 7-9
10-12
- SUBJECT:** Social Studies
- ACTIVITY:** 1. Write, as a class, to Common Cause, 11 W. 42nd St., New York, N. Y. to find out information they may have on the development of a National energy policy. Discuss their reply.
- SUBJECT:** Social Studies, Science
- ACTIVITY:** 1. Write to your Congressman to see which bills have been introduced to develop alternative sources of energy. Have any of these bills been passed? If so, how much money was appropriated to implement the law? Is the Government supporting any group which is trying to develop solar energy or wind energy, for example? How does your research point up the need for a National energy policy? You might consider writing your Congressman again, after your survey, to express your opinions.
- GRADE LEVEL:** 10-12
- SUBJECT:** Social Studies
- ACTIVITY:** 1. Compile newspaper, magazine and other recent reports on what steps are being taken by Government to alleviate the energy shortage. Try to ascertain if progress is being made toward the establishment of a National energy policy. Determine what Government agencies have direct or indirect responsibilities in the energy policy area.
- SUBJECT:** Social Studies, Mathematics, Science
- ACTIVITY:** 1. In the September 1971 issue of "Scientific American" is an article 'Energy and Power'. In the article is a graph of the U. S. energy consumption from 1850 to the year 2000. Using data from the graph, make a graph of the total energy consumption as a function of the time - but use semi-log graph paper. Plot the total energy on the vertical (log) axis. Does this graph give a more accurate means of projecting energy demands? Look carefully at the time spans between 1900-1930, 1930-1950, and 1950 to the present. In the same issue of "Scientific American" is an article entitled "Decision-Making in the Production of Power". Having read this article, evaluate some of the factors which must come into play if we are to accurately project and achieve our energy requirements in future years. Who will make these decisions?

GRADE LEVEL:

10-12

SUBJECT:

English, Science, Social Science

ACTIVITY:

1. In an essay, briefly but accurately explain the role of governmental agencies, (at all levels) in formulating and developing a National energy program. Why is the program needed?

SUBJECT:

Social Studies, English

ACTIVITY:

1. Discuss the tenets of a national energy policy. What would have to be included in such a policy (i.e., price control, rationing, area distribution, conservation measures, funding, control, new developments, etc.)? Write your own National energy policy. Perhaps the class could be divided into committees to write various sections. Later, the sections could be put together. You might consider sending it to your Congressman

OBJECTIVE: To demonstrate the value of public participation and referendum in the planning, development and conduct of power generating facilities.

PROBLEM AREA: Energy - Society

GRADE LEVEL: 7-9
10-12

SUBJECT: Social Studies, Science

ACTIVITY:

1. What is meant by a referendum? Give three examples of local environmental issues on which a referendum could be called.
2. You live in a pleasant rural area near a large body of water. Because of increased power needs in surrounding areas the local electrical company proposes building a nuclear plant in your town. What can you do about the situation if you are not in favor of it? How is a public referendum organized? Of what value is it? Could public opinion be strong enough to deter the utility company from building? What arguments do they have?

SUBJECT: Science, Social Studies, English

ACTIVITY:

1. List three pertinent issues affecting your life which you would rather have some control over by way of voting, rather than having the decision made for you by a governmental agency.

GRADE LEVEL: 10-12

SUBJECT: English, Social Studies, Science

ACTIVITY:

1. One of the most outspoken and controversial critics of nuclear energy generating facilities has been Ernest J. Sternglass, a Professor of Radiation Physics at the University of Pittsburgh. In his book "Low Level Radiation," Sternglass argues that nuclear generators in their present form pose a grave threat to human health. Among other claims, Sternglass says that long exposures to low-level radiation produce increases in diseases fatal to human beings and in the level of infant mortality. Read Sternglass book, evaluate the data he presents and conduct an in-class discussion on whether there is a necessity for public referendums on the planning of power generating facilities.

SUBJECT: English, Social Studies

ACTIVITY:

1. Write a short essay taking a position on the role of public referendum versus the role of elected officials on voting for issues which directly affect people's lives.

OBJECTIVE: To identify consumer products from petrochemicals.

PROBLEM AREA: Energy - Society

GRADE LEVEL: 4-6
7-9
10-12

SUBJECT: English, Science

ACTIVITY: 1. Correctly define what is meant by petrochemicals.

SUBJECT: Science, Social Studies

ACTIVITY: 1. Select one of the following areas to do research on:

- a) agriculture
- b) housing
- c) plastics

Relate the one you choose to the petrochemical industry - e.g.

- a) agriculture and fertilizer
- b) housing and insulation, plastic pipe, bathroom fixtures, etc.
- c) plastics and tools, dishes, kitchen ware, furniture, toys, etc.

What is the future of these industries if oil stops flowing?

GRADE LEVEL: 5, 6, 7-9

SUBJECT: Science, Social Studies, English

ACTIVITY: 1. Select one product made from petrochemicals. Do some research and tell how it was made - from raw material to finished product.

GRADE LEVEL: 7-9
10-12

SUBJECT: English, Social Studies, Science

ACTIVITY: 1. Write a paper on "The Future of the Petrochemical Industry". Include facts on what the petrochemical industry is, the products it produces, and what you think the future holds for this industrial complex.

SUBJECT: Science, Social Studies

ACTIVITY: 1. The Shah of Iran stated that his country is not as interested in selling tremendous numbers of barrels of oil today, as it is in keeping much of its oil for the petrochemical needs of the future. Explain the implications of his statement.

OBJECTIVE: To examine the regulatory mechanisms for monitoring and controlling nuclear power development.

PROBLEM AREA: Energy - Society

GRADE LEVEL: 4-6
7-9
10-12

SUBJECT: Social Studies, Science

ACTIVITY: 1. Identify the two major functions of the Atomic Energy Commission. Identify the present director. What is the background of this person? What are some of his/her views?

GRADE LEVEL: 7-9
10-12

SUBJECT: Social Studies, Science

ACTIVITY: 1. Identify some members of Congress who serve on the Joint Committee on Atomic Energy. What is the function of this Committee?
2. Recent critics of nuclear generating plants have pointed out that the quality of construction in the plants has been very poor. What regulations are in force concerning atomic plant construction? Using an index to a resource such as the "New York Times", research articles on this topic. Prepare a report on the implications for the class.

SUBJECT: Science, Social Studies, English

ACTIVITY: 1. Make a chart on the blackboard listing existing regulations for atomic power production. Headings might be:
a) Regulations for the development of atomic plants
b) Regulations concerning workers within the plants
c) Regulations for the disposal of wastes

Under each heading write as many regulations as possible. Who imposes and enforces them? Select one regulation and write a newspaper article on it. Include the pro's and con's.

GRADE LEVEL: 10-12

SUBJECT: Social Studies, Science

ACTIVITY: 1. List three major laws which are responsible for the United States' current policy and program decisions regarding the development of nuclear power.

SUBJECT: English, Social Studies, Science

ACTIVITY:

1. What are the regulations concerning people who work in nuclear power plants? Elaborate safeguards have to be taken to prevent the theft of fissionable materials. It is felt that these materials could be used to make a nuclear bomb. Do you feel that a small group of people could manufacture an atomic bomb? One person's opinion on this question can be found in three December 1973 issues of "The New Yorker" magazine, under the title 'Binding Energy'. The three articles are a profile of a nuclear scientist, Ted Taylor. After reading the articles, do you feel that Ted Taylor's point of view is reasonable? What additional safeguards do you feel are necessary to protect against possible nuclear sabotage or nuclear blackmail?

SUBJECT: Social Studies, Science, English, Health

ACTIVITY:

1. Write an environmental impact statement for a nuclear plant.
2. You are a newspaper reporter. Write an article, or series of articles, explaining the regulatory safeguards which must be taken by utility companies in the building and use of atomic plants.
3. Imagine that you live in a rural section of the state and that there is talk of a nuclear plant being built in your town. Debate the pro's and con's. What will the social and economic gains be? What are some disadvantages?

OBJECTIVE: To determine public health hazards associated with nuclear power development.

PROBLEM AREA: Energy - Society

GRADE LEVEL: 4-12

SUBJECT: Science, Health

ACTIVITY: 1. There are two kinds of atomic energy - fission and fusion. Explain the differences between them. Tell why one is less hazardous than the other. Why is it not used today? What is its future?

GRADE LEVEL: 7-9

SUBJECT: Social Studies, Science, Health

ACTIVITY: 1. Identify some potential health hazards associated with nuclear power. How do they come about? Are there any ways of eliminating these health hazards?

GRADE LEVEL: 7-9
10-12

SUBJECT: Social Studies, Science, Health

ACTIVITY: 1. Discuss the relative dangers involved in nuclear power versus other forms of energy such as oil, gas, coal, etc. by listing the kinds of environmental impact peculiar to each source.

SUBJECT: English, Social Studies, Science, Health

ACTIVITY: 1. Report an actual hazardous incident resulting from a nuclear power operation. Newspaper and magazine articles may be used as references.

GRADE LEVEL: 10-12

SUBJECT: Science, Social Studies, Health

ACTIVITY: 1. Obtain a schematic diagram of a typical water cooled nuclear generator. Discuss how the various components of this generator operate. Try to answer the following questions: Why do nuclear reactors require large volumes of water for cooling? Is the heat which is transferred to cooling water during the cooling process a valuable form of energy and if it is, can it be used for any purpose? Are there alternative means for cooling nuclear reactors? In what sense is hot water a polluted material? Are there any circumstances under which returning heated water to a natural body of water could be beneficial? Is the hot water exhaust from a nuclear reactor

radioactive in any way? One of the major criticisms which environmentalists have directed against nuclear generating facilities is that they produce thermal pollution in natural bodies of water. Are there health hazards related to thermal pollution? If so, what are they? Do the benefits of obtaining energy from nuclear reactors outweigh the disadvantages of thermal pollution? Are the negative effects of thermal pollution sufficient reason for banning the widespread use of nuclear reactor generating facilities?

SUBJECT:

Social Studies, English, Science, Health

ACTIVITY:

1. Some people believe that with the proliferation of atomic plants many dangers exist. Write an imaginative story of an individual or group of people who have managed to steal enough material from an atomic plant to make an atomic bomb. What demands are they making for their promise to not use the bomb? What would result if the demands were not met and the bomb were actually used?
2. Do some research in your library. Read of the health hazards associated with nuclear power development. Report to your class.

SUBJECT:

Social Studies, English, Health

ACTIVITY:

1. One of the concerns about nuclear development is the possibility of an accident at a nuclear plant which would kill thousands of people outright and other thousands in time. Read, in current books and magazines such as Time, Newsweek, etc. about these possibilities and the safeguards that are being taken to prevent them. Are these safeguards effective enough in your estimation?

- OBJECTIVE: To evaluate the notion that abundant, clean and efficient energy will solve many of mankind's social ills.
- PROBLEM AREA: Energy - Society
- GRADE LEVEL: 4-10
- SUBJECT: Social Studies
- ACTIVITY: 1. Provide some historical examples where a valuable commodity has been made available to the general public at low prices. Describe what happened as a result. How has it affected man and his way of life?
- GRADE LEVEL: 4-12
- SUBJECT: Social Studies
- ACTIVITY: 1. It seems that as Americans have increased their living standard, their consumption of energy has risen. Discuss ways in which the quality of American life can be improved without consuming more energy. Explain the difference between standard of living and quality of life.
- SUBJECT: Art, Social Studies, English, Science
- ACTIVITY: 1. The United States was at one time described as having "streets paved with gold". This was during hard times - times of food shortage and work shortage in Europe. Draw comparisons between Utopias that were believed to exist. What are the similarities between Utopias and the life styles of the wealthy. Sketch in pen and ink, pencil or tempera paint the kinds of things people living in the United States would ascribe to a Utopia. Are present day Utopias more reliant on energy than were those of the past? Do people still need to believe in Utopias? Why?
- GRADE LEVEL: 6-9
- SUBJECT: Social Studies, English
- ACTIVITY: 1. Write a poem, story or song showing how the Industrial Revolution changed the lives of people. Relate the possibilities for change to the development of new forms of energy.
- GRADE LEVEL: 7-9
10-12
- SUBJECT: Social Studies
- ACTIVITY: 1. Make a list of social ills on the blackboard. Discuss them.

Is abundant, clean, efficient energy the answer for these problems? Explain why or why not.

GRADE LEVEL: 10-12

SUBJECT: Social Studies, Science, English

- ACTIVITY:
1. In a short report, develop a point of view which argues that an abundance of clean, inexpensive energy will become a reality for the world within the next 20-50 years. How will life styles change?
 2. In a short report, develop a point of view which argues that an abundance of clean, inexpensive energy will never be practical or feasible.

SUBJECT: Social Studies

- ACTIVITY:
1. Do a study on some minority group - blacks, immigrants, women, etc. and show how their lives have been changed through the use of energy. For example, have women really been liberated by time-saving devices in the kitchen?

SUBJECT: Social Studies, English

- ACTIVITY:
1. Do a psychological study on the woes of mankind. Has clean, cheap and efficient energy made man any happier, less belligerent, more content with his lot?

OBJECTIVE: To determine ways in which citizens can personally respond in times of energy shortages.

PROBLEM AREA: Energy - Society

GRADE LEVEL: 4-6

SUBJECT: Social Studies, Science

ACTIVITY: 1. List 10 things you do using electricity which can also be done in other ways - e.g. mowing the lawn, brushing your teeth, etc. Try doing them "the other way" and convince your family also to save energy.

SUBJECT: Social Studies, Art, English, Science

ACTIVITY: 1. Research and list as many forms of energy waste that you can observe in your own home, and the solution. (Examples might include leaving lights on, preheating the oven for too long a period, constant observing of what is cooking inside, leaving windows open, inadequate insulation, open fireplace flue.) In an illustrated booklet produced cooperatively by the class include the most frequent examples. Distribute copies to other classes and to parents.

GRADE LEVEL: 4-6
7-9

SUBJECT: Social Studies, Art

ACTIVITY: 1. The amount of garbage produced on a per capita basis by Americans has been growing steadily. Examine your family's garbage. What is it composed of? How much of it is wasteful? What could be recycled? How does the garbage of an American household differ from that produced by the average family 100 years ago? How did people 100 years ago dispose of their garbage? Did they have a disposal problem of any kind? Report your findings in a series of cartoons. They can be funny, but should reflect the seriousness of the problem as well.

SUBJECT: Social Studies, Art, Science

ACTIVITY: 1. Describe your favorite place. Include the things that are there that make you like the place so much. Also, write down the types of energy that were used to make the place what it is. For instance, if your favorite place is a pool or a park, consider the types of energy needed to create it. Are all favorite places man-energy-made? Could you enjoy any without using a form of energy? Draw or paint your favorite place.

SUBJECT: Social Studies, Science

ACTIVITY:

1. Make a list of all the ways in which energy is used in your school. Divide the list into three groups: Greatly Needed, Somewhat Needed, Not Needed. Further divide the categories on the basis of: Most Efficient, Efficient, Not Efficient. Take advantage of the best information sources: the Principal, teachers and school custodian. This effort can serve as the basis for a sound energy savings program. Follow up by monitoring the amount of energy consumed during 2-week or 1-month intervals.

GRADE LEVEL: 4-12

SUBJECT: Science, Social Studies

ACTIVITY:

1. With your family, list the ways that energy is used in your home. Rearrange the items on the list in order from greatly needed to not needed. Which items would you and your family be willing to do without? Actually try doing without them for at least a week. Could you do without them permanently?

GRADE LEVEL: 7-9
10-12

SUBJECT: Industrial Arts, Art

ACTIVITY:

1. Examine something you use every day which uses energy. Explain whether or not it is energetically well-designed. Design it on paper. Then redesign it, making it use less energy.

SUBJECT: Art, Science, Home Economics, Industrial Arts

ACTIVITY:

1. Identify, in the kitchen of your school cafeteria or at home, an appliance which uses energy. Design a substitute mechanism to get the job done using less energy. Write a description of it, make a diagram or construct a model.

GRADE LEVEL: 10-12

SUBJECT: Science, Social Studies

ACTIVITY:

1. Live for one week without an electrical device previously used by you every day. Can you do it? Why should you try, since pricing policies currently penalize you for using less electricity? Do you think utility companies will change their rate policies?

SUBJECT: Social Studies, Science, English

ACTIVITY:

1. Role play the following: Your community has been aroused by the impending shortage of gasoline and home heating oil. Already schools are threatening to close, or have already closed, and rationing of gas may prohibit many people from commuting to work. A public hearing is called to find out some of the reasons for the shortage and what can be done about it. The people asked to participate from within and without the community include: a) a Congressman, b) a Senator, c) a utilities spokesman, d) an executive vice-president of an oil company, e) a housewife, f) a Government economist, g) an ecologist and h) a newspaper editor. Each person should address himself to the two questions above. Work may be done orally or in written form.

SUBJECT:

English, Social Studies, Science

ACTIVITY:

1. Write a newspaper article on ways in which people can conserve energy. The first paragraph should be an introduction to explain the necessity for conservation. Subsequent paragraphs could concern themselves with specific conservation measures - for example - 1) use of automobiles, 2) use of appliances, 3) recreation, etc. If you would prefer, you could write a series of articles, one on each topic. If your article is really good, you might try to get it published in your local newspaper.

SUBJECT:

English, Creative Writing, Music

ACTIVITY:

1. Write a story, song or poem about a mythical hero who discovers a fantastic device called "The Thing" or "The Box", or whatever you want to call it. The device saves tremendous amounts of energy. The hero manufactures "The Thing" and starts to give them away. Enter the villains - vested interests, utility companies, etc. What happens? Is our hero allowed to go on, or is his head bashed in?

- OBJECTIVE: To determine recycling and reuse of materials as it relates to energy conservation.
- PROBLEM AREA: Energy - Society
- GRADE LEVEL: 4-6
- SUBJECT: Science, Social Studies, Art
- ACTIVITY: 1. List ten items of the everyday kind which could be effectively recycled and reused and which could help conserve energy. If you feel artistic, make a collage of magazine or newspaper pictures illustrating your choices.
- SUBJECT: English, Social Studies
- ACTIVITY: 1. In a short paragraph, differentiate between recycling and reuse, citing some examples of each.
- GRADE LEVEL: 4-6
7-9
10-12
- SUBJECT: Science, Social Studies, English
- ACTIVITY: 1. Get a copy of a soft cover book called Energy Primer; Solar, Water, Wind and Biofuels, Portola Institute, 558 Santa Cruz Avenue, Menlo Park, California 94025 - \$5.50. This book is written and edited by the Whole Earth Truck Store and others, and would make a good addition to your library. It contains much information as well as great diagrams. Read about some of the projects using recycled materials. Report to your class on one. Illustrate it if you can.
- SUBJECT: Art, Social Studies, Science, Industrial Arts
- ACTIVITY: 1. Recycle a common product. Use your imagination and have fun....a trinket box out of a cheese box - metal flowers out of tin cans, toy furniture out of cardboard, a doll house out of a large box, a game out of miscellaneous items. Use fabrics, cord, paper, wool, etc. Have an exhibit of recycled materials. Be able to explain how these uses save energy.
- SUBJECT: Science, English, Social Studies, Art
- ACTIVITY: 1. Write an illustrated report on the recycling of some material. You will have to do some researching first. Consider glass, aluminum, paper, cardboard, etc. File

the report in your library or classroom for other people to read.

SUBJECT: English, Creative Writing

ACTIVITY: 1. Write a story of an imaginary fellow thought to be on the dumb side. He lives in a shack near the "dumps" and reads old newspapers reporting on the energy crisis. Looking around, he discovers all kinds of treasure - paper that can be recycled, glass to be melted down and reused, precious metals, etc. He works out a system to use all the stuff, gets a corner on the garbage market and makes a million dollars.

GRADE LEVEL: Science

ACTIVITY: 1. Statistics indicate that the amount of solid garbage produced on a per capita basis by Americans has been growing steadily for some time. Conduct an analysis of the garbage your family produces and discards. What is it composed of? What components of our modern garbage can probably account for the major increase in the per capita volume? How does the garbage of a modern American household differ from that produced by the average American family 150 years ago? How did people 150 years ago dispose of their garbage? Did they produce as much? Did they have a disposal problem of any kind? Speculate on whether or not and to what extent they might have practiced recycling of refuse. Make a list of suggestions we might try today based on the conservation ideas of our ancestors.

SUBJECT: Science, Social Studies

ACTIVITY: 1. Discuss the following. At what point does recycling and reuse become economically profitable. Is it at the same time as when recycling and reuse is socially and environmentally desirable? Explain.

GRADE LEVEL: 7-9
10-12

SUBJECT: Science

ACTIVITY: 1. Do some reading on the recycling of garbage. For instance, there is a system which applies great heat to the waste materials. Molten metals are siphoned off, molten glass is diverted into cauldrons, etc. The sludge that is left can be made into building blocks. Report to the class. Discuss. Could garbage become a resource?

SUBJECT: Science, Art, Music, Social Studies, English

ACTIVITY: 1. Do a photographic slide show on the recycling efforts of your town, or a nearby town. Write a taped script to go with the pictures. Show the slides to social and fraternal organizations in your town. If you do not take pictures, you could still interview people and do a written report.

SUBJECT: Science, Social Studies

ACTIVITY: 1. Divide the class into small groups to research garbage in their own community. What happens to refuse after it is put into a garbage can? Who picks it up? Is it a municipal refuse collector or a private collector? Does the family pay for this service directly, or is it part of the municipal tax bill? How much does it cost? What does it cost for the entire community? Where is the garbage ultimately disposed of, and in what way is it disposed of? What does the term "sanitary landfill" mean? Is there any best way for disposing of domestic refuse? Will the method of garbage disposal being used by your community be applicable on a long-term basis? Does it produce any form of pollution, either air pollution or visual pollution? Does it pose any form of health hazard? Are there more attractive alternative forms of disposal, and if so, why are they not currently being used? Relate the mountains of garbage to the supply of energy. What kind of life style can we subscribe to which would use less energy on throw away items?

GRADE LEVEL: 10-12

SUBJECT: Science

ACTIVITY: 1. Methane is a gas similar to natural gas. It can be burned directly for heat and light, stored for future use or compressed to power heat engines. Look up some materials on the production of methane gas, the by-product of organic material decay. (This may tickle your funny bone, but cars have been moved using methane gas produced with chicken manure!) There is a really good report on the process of manufacturing methane gas on page 142 in The Energy Primer. (See previous activity for data on this book.)

2. Calculate the amount of local garbage capable of being burned. Devise a plan by which the municipality could supply the town's electrical needs by burning garbage and using the resulting energy to generate electricity. Does the municipality produce enough garbage to fill this need? If not, where could the town get enough? Could

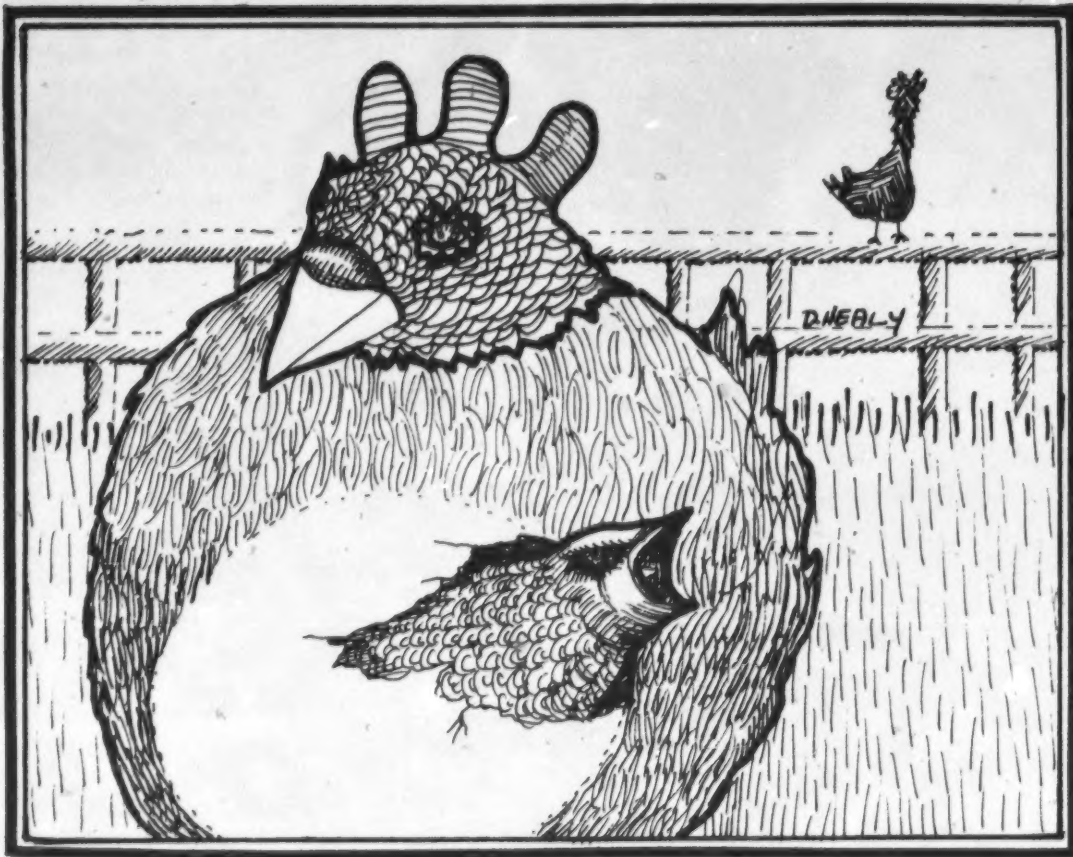
such an operation be made profitable? Would it solve any problems besides waste disposal? Would it create problems that do not currently exist?

SUBJECT:

Social Studies, Science, English

ACTIVITY:

1. List five different common containers used in food, toiletry, and cleaning products. List the energy sources used to produce each. Taking the least well-designed package on the list, redesign it (either on paper, by sketch or written description, or model). In redesigning the product container, keep in mind product suitability, biodegradability, visual appeal, color, type choice, shapes used, for whom the product is intended, shipping and packing ease, strength, disposability. (Does it degrade? Are there ways to design a package that does not need to be disposed of.) Afterwards, as a class, discuss - is packaging really necessary or is it a gimmick for greater sales?



- OBJECTIVE: To discuss social and economic incentives in attaining sound energy conservation measures.
- PROBLEM AREA: Energy - Society
- GRADE LEVEL: 7-9
- SUBJECT: Art, Social Studies, Science, English
- ACTIVITY: 1. List some examples of positive economic incentives which can be employed to conserve energy use. Make a poster depicting one example.
- GRADE LEVEL: 7-9
10-12
- SUBJECT: Social Studies, Science
- ACTIVITY: 1. Government spokesmen and energy experts have been appealing to the American public to do their fair share in conserving energy. Compile a list of those things that can be done in homes, in school and in personal habits, in general, to conserve energy. Discuss - a) whether or not you feel these efforts are worthwhile, b) how much energy will be conserved by these efforts, c) what individuals can do about irresponsible citizens, institutions or agencies which are not conserving energy.
- GRADE LEVEL: 10-12
- SUBJECT: Social Studies
- ACTIVITY: 1. In a short essay, describe how the legal system can operate to change patterns of energy consumption in a socially positive way.
- SUBJECT: Social Studies, Science
- ACTIVITY: 1. Certain incentives to use "more" rather than "less" are built into our system. Discuss some of these incentives (i.e. the greater the use of electricity, the cheaper the rate; in income tax deductions a four-cylinder car is entitled to only half the deduction of a bigger, more expensive gas guzzler). What social and economic incentives can we now use to make people think "less" rather than "more" or "smaller" rather than "bigger".
- SUBJECT: Science, Social Studies, English
- ACTIVITY: 1. Select one of the following topics and write a paper on it:

- a) Does our society waste energy?
- b) Can waste be defined outside a societal or environmental context?
- c) How would you define energy waste in the social and cultural context of America in the 1970's?
- d) Is driving a big car a waste of energy? (Is a luxury car more wasteful today than it was a year ago, or six months ago? If so, how?)

In each case, suggest some positive actions which might be taken to conserve energy. Read your paper to the class.

SUBJECT: Social Studies, Science

ACTIVITY:

1. Monitor the amount of kilowatt hours of electricity used in your home for a month. Plan a strategy for utilizing 15% less electricity. What social and economic incentives would there be? Social gains might be the possibility for a family to be together more at meal times, or together watching one TV program, etc. An economic gain might be a lower electric bill. After a month's trial, report on what happened. What is the likelihood that your family would continue its energy conservation measures.

SUBJECT: Social Studies, Science, English, Creative Writing, Music

ACTIVITY:

1. Write a far out story, poem, ballad or song depicting a new centralized society of a make believe country which decrees the amount of energy to be used by each man, woman and child. The social and economic incentives are so built into the program that the people are practically "brainwashed" by the propaganda and never miss the old ways of using unlimited energy.

INTERESTING SUPPLEMENTARY REFERENCES

BOOKS:

Consider the Process of Living, William Eddy, Jr. et al. Conservation Foundation, Washington, D. C. 1972. This is not a technical book. It relates energy to man and considers the implication of energy to life style. Very well illustrated.

Energy - A Crisis in Power, Holdrin and Herrera. Sierra Club Books, 597 5th Avenue, New York. An excellent guide on energy, its use, effects and conservation. Recommended for class and school libraries as a comprehensive overview.

The Limits to Growth, Meadows et al. Universe Books, N. Y. 1972. An attempt to project, through the use of the computer, the future of man on food, natural resources, industrial development and pollution. Controversial. Good reading for high school students.

Power and Energy, Frank Ross. Lothrop, Lee & Shepard Co., N. Y. 1967. Better for upper classes unless student is a good reader. The author surveys various energy sources, sun, wind, water, atomic, etc. Illustrated with drawings and photographs.

I Seem To Be a Verb, Buckminster Fuller. Bantam Books, N. Y. 1970. A book of quotes on the environment and man's future. Quotations are gleaned from various sources. Excellent as springboards for discussions, titles for themes, etc.

FILMS:

At Home, 2001. Produced by CBS News. McGraw-Hill, N.Y. 1967. Sound/color. 16 mm. 25 minutes. Rental \$18. Walter Cronkite, narrator. Presents a life style scenario of the future and shows how we may be utilizing energy sources.

The Energy Crisis - Power. General Electric Educational Films, Corporations Park Bldg., Scotia, N.Y. 12302. Sound/color. 16 mm. 19 minutes. Rental \$20. An NBC white paper. Part of an excellent TV series. Definitive and informative.

The Quality of Life. Modern Talking Pictures, Inc., 2323 New Hyde Park Rd., New Hyde Park, N. Y. 11040. Sound/color. Available on free loan. What is the quality of life? Can it be measured? A discussion of personal values in relation to public, group and community decisions.

PAMPHLET:

What an Individual Can Do to Lessen the Strain on the Environment. Ecology Information Center, Sacramento, Calif. 1971. Free. This pamphlet is filled with things we can do to aid the environment and help meet the energy crisis. Excellent resource for pupil reports and discussions.

KIT:

Energy and The Environment, Fowler and Mervine, University of Maryland, \$.75. Contains a reprint of an article, "Energy & the Environment" by J. M. Fowler from The Science Teacher magazine, December 1972. It explains where energy comes from and where it goes, the effects of energy use on the environment and new sources of energy. Also contains a fine annotated bibliography.